Spring 2013

Dimensions Spring 2013

Iowa State University Department of MechanicalEngineering

IOWA STATE UNIVERSITY
College of Engineering

DIMENSIONS

Department of Mechanical Engineering

Volume No. 21 | Issue No. 2

Message from the Chair

Since arriving in October as the new chair for the Department of Mechanical Engineering, I have thoroughly enjoyed getting acquainted with the department's many students, faculty and staff, alumni, and industry partners. It has been a whirlwind of wonderful experiences—within the department, across the Iowa State campus, and beyond! I am deeply honored to be at Iowa State University and to be entrusted with the stewardship of this outstanding department.

In December 2012, I traveled through many parts of Iowa and had the pleasure of meeting many of our alumni. I am proud of the success of our alumni. To name a few examples, Dr. Sadanand Joshi (PhDME'78) received the College of Engineering's Anson Marston Medal, in recognition of his contributions to developing horizontal-well technology to produce crude oil and natural gas, and Leia Guccione (BSME'04) received the ISU Alumni Association's Outstanding Young Alumni Award, in recognition of her leadership in the U.S. Navy, where she is a decorated nuclear engineer. Every day I am reminded of the tremendous impact that alumni have on the success of this department, the engineering college, and the university. Steadfast support from so many alumni and in so many ways means that our students and faculty have classroom and laboratory experiences that are among the best in the nation.

The department had another record-breaking fall enrollment—1503 undergraduate students. Mechanical Engineering is now the largest undergraduate program on campus. We anticipate continued growth because students and their parents recognize that a degree from Iowa State's Department of Mechanical Engineering gives them great preparation for the workforce. I am encouraged to see so many young people entering Mechanical Engineering, and as chair I consider it my duty to see that they all receive the quality, hands-on educational experience for which ISU Mechanical Engineering has become internationally renowned. To better support this record number of students and leverage our excellent research program, we hired 6 new faculty members in 2012. The new faculty members, in addition to myself, include Assistant Professor Ganesh Balasubramanian, Assistant Professor and Henry Black Faculty Fellow in Mechanical Engineering Sourabh Bhattacharya, Assistant Professor Alberto Passalacqua, Associate Professor Cris Schwartz, and Assistant Professor Mark Mba Wright. We are proud to have the talent of these individuals, and you can read about each of them in this newsletter. Recent Department of Mechanical Engineering achievements are a testament to its excellence. These highlights are featured in this newsletter.

My goals in 2013 are to continue improving the already excellent education that students receive here by exploring ways to better house our community of students, faculty, and staff; by updating and improving the teaching laboratories; by increasing internships and international experiences' by recruiting additional excellent faculty; and by increasing diversity at all levels. We are proud to be a part of one of the few engineering colleges (if not the only one) in the country where half of the department chairs are women.

2012 has been a banner year; I anticipate that 2013 will be equally exciting!

As always, we welcome you to contact us and let us know how you are progressing in your careers. We appreciate our outstanding roster of alumni and the impacts they make on the field of mechanical engineering and beyond. You can contact the department at mealumni@iastate.edu; we would love to hear from you!

Caroline Hayes
Mechanical Engineering Department Chair
Lynn Gleason Professor of Interdisciplinary Engineering

On the cover

Iowa State's new bio-oil gasifier uses heat and pressure to convert bio-oil into a synthesis gas that can be used to make transportation and boiler fuels.

Volume No. 21 | Issue No. 2

Published twice a year by the Department of Mechanical Engineering, College of Engineering, 2025 Black Engineering, Iowa State University, Ames, IA 50011-2161; *www.me.iastate.edu*; *isume@iastate.edu*

Prepared by Alex Rausch, ME Communications Specialist, *arausch@iastate.edu*

Iowa State researchers double down on heat to break up cellulose, produce fuels and power

Nicholas Creager recently pointed to the nuts and bolts of one of Iowa State University's latest biofuel machines.

The 6-inch diameter, stainless steel pipe is the pressure vessel, which is essential for the system's operation, said Creager, a doctoral student in mechanical engineering and biorenewable resources and technology. It's a little over three feet long and about a foot across. It can contain pressures up to 700 pounds per square inch.

Then Creager picked up a dark gray pipe that's a few inches across, is wrapped in insulation and fits inside the pressure vessel. It's the system's reactor. It's made of silicon carbide and can operate at temperatures exceeding 1,800 degrees Fahrenheit.

Next was a finger-sized nozzle that mixes bio-oil with oxygen and sprays it into the top of the reactor.

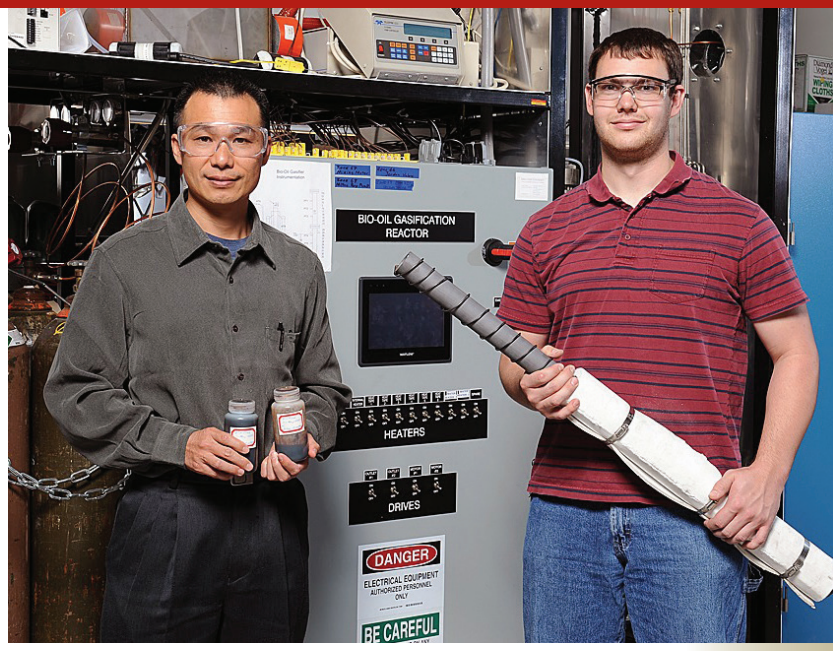
Add a bunch of toggle switches, electronics, pipes, a sturdy frame and some very thick bolts and you have a bio-oil gasifier. It will allow Iowa State researchers to combine two thermochemical technologies to produce the next generation of fuels from renewable resources such as corn stalks and wood chips.

First, biomass is fed into a fast pyrolysis machine where it's quickly heated without oxygen. The end product is a thick, brown oil that can be divided and further processed into fuels. Researchers sometimes describe bio-oil as densified biomass that's much easier to handle and transport than raw biomass.

Second, the bio-oil is sprayed into the top of the gasifier where heat and pressure vaporize it to produce a combination of (mostly) hydrogen and carbon monoxide that's called synthesis gas.

That gas can be processed into transportation fuels. It can also be used as boiler fuel to create the steam that turns turbines to produce electricity.

"We hope to be able to use cellulosic biomass as opposed to using corn grain for the production of fuels," said **Robert C. Brown**, the director of Iowa State's Bioeconomy Institute, an Anson Marston Distinguished Professor in Engineering and the Gary and Donna Hoover Chair in Mechanical Engineering. "This helps us move toward cellulosic biofuels."



ME associate professor Song-Charng Kong, left, and ME doctoral student Nicholas Creager are studying a new bio-oil gasifier. Kong is holding samples of bio-oil that can be vaporized by the machine. Creager is holding the system's reactor, which can operate at temperatures exceeding 1,800 degrees Fahrenheit. Photo by Bob Elbert.

Brown said researchers have yet to perfect ways to biologically break down plant cellulose to get at the sugars that are converted to fuels. And so the ISU researchers are turning to nature's solution.

"Nature uses high temperatures to quickly decompose biomass," Brown said.

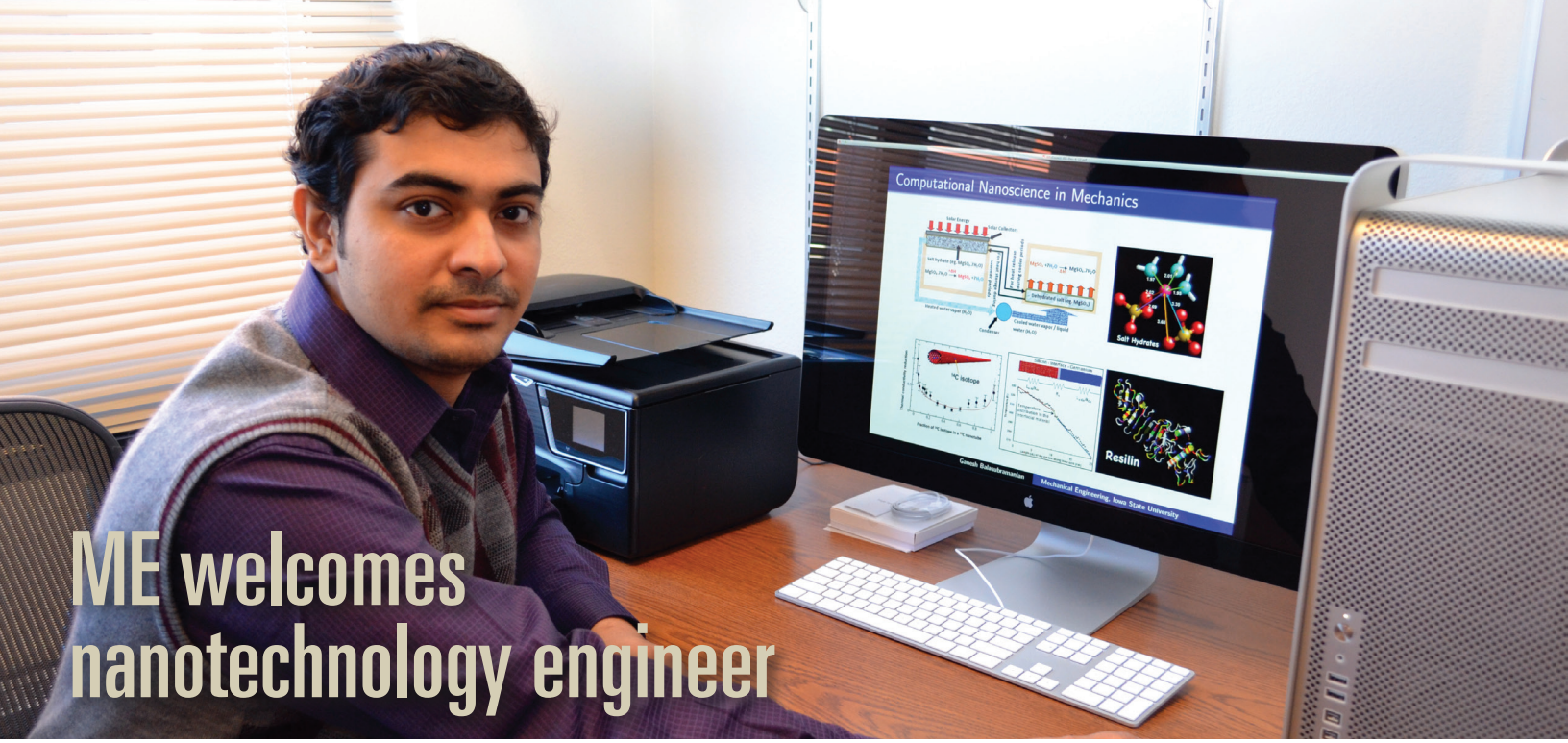
The bio-oil gasifier has been fully operational since June and has been converting bio-oil made from pine wood into synthesis gas. As the project moves beyond its startup phase, researchers will use bio-oil produced by ISU researchers and fast pyrolysis equipment.

The gasifier was built as part of a two-year, nearly $1 million grant from the U.S. Department of Energy. Another three-year, $450,000 grant from the Iowa Energy Center will allow researchers to study and refine bio-oil gasification.

Song-Charng Kong, an associate professor of mechanical engineering who's leading the latter project, will build a computer simulation model of bio-oil gasification. The model will take into account changes in temperature, pressure and biomass. It will allow researchers to understand, predict and ultimately improve the gasification process.

The project will also develop a systems simulation tool that allows researchers to examine the technical, economic and big picture implications of bio-oil gasification. And finally, the project will develop a virtual reality model of a full-size plant that will allow researchers to see, study and improve a plant before construction crews are ever hired.

Continued on Page 5



ME welcomes nanotechnology engineer

Ganesh Balasubramanian is looking forward to immense opportunities in teaching and nanotechnology research as he begins his new faculty position in the mechanical engineering department at Iowa State.

Initially planning on pursuing a statistics degree, Balasubramanian eventually elected to study mechanical engineering at Jadavpur University due to the wide range of scientific fundamentals and technological applications it provided.

His pursuit of an advanced degree brought him from India to the U.S., where he began working towards his PhD in engineering mechanics at Virginia Tech. Serving as a teaching assistant for several engineering science and mechanics courses also heightened his awareness of the benefits a career in academia provides.

"Working in higher education offers freedom to pursue one's interests," he says. "Just like athletes earn their livelihood by playing sports they excel in, academics build their careers by teaching and researching. In both cases, unless you enjoy the work, you can never succeed."

Balasubramanian also spent considerable time on research as a PhD student. His first project, funded by the National Science Foundation, concentrated on developing and implementing a nanotechnology curriculum for engineering freshmen using a novel spiral curriculum model that allows room for students to revisit difficult concepts to gain a better understanding.

At the same time, he was also working in Virginia Tech's Multiphysics Research Group on projects involving molecular simulations of nanoscale transport phenomena. Balasubramanian's research within this group focused on several fundamental scientific problems, including designing energy storage systems, understanding the physics of thermoelectrics in nanoscale, investigating mechanical properties of elastomeric proteins, and understanding the effects of interfacial thermal resistance in heat transfer across dissimilar materials.

"My research has been very interdisciplinary, as the projects I have been involved with incorporated fundamental aspects of ME, chemical engineering, physics, mathematics, chemistry, and computer science," Balasubramanian explains.

"I was, and still am, fascinated by how different disciplines are interlinked when investigating concepts related to energy and nanomaterials."

Balasubramanian traveled to Germany after completing his doctorate in 2011, working as a postdoctoral scientific assistant at the Technische Universität Darmstadt.

This fall, he started at Iowa State as an assistant professor. His immediate focus will be establishing a research program centered on the influence of separate dimensions on mechanical properties of materials, and how to employ them for energy related applications that range from nano to macro scales.

Understanding the materials' behavior at the nanoscale will allow researchers to design new materials for targeted applications, improve properties of existing devices, and control different behaviors by manipulating systems at the molecular level.

"Research in nanotechnology has grown by leaps and bounds over the last decade, and with it, questions have emerged about applying that research for the utilization of humankind," Balasubramanian says.

"Blending the ideas, motivation, skills, capabilities, support, and backing of a variety of researchers will be key to developing undiscovered scientific principles and creating cutting-edge technology."

In addition, he will be teaching Heat Transfer (M E 436) during the spring semester. He is looking forward to integrating mentoring into his teaching techniques to successfully educate his students.

"Knowledge is a gift, and it is our responsibility as instructors to share that with the students by being honest, committed, and diligent," Balasubramanian says.

"We also have to be constantly receptive to necessary alterations in the process to make learning positive and effective."

Contributed by ECR

Vance receives honorary doctorate degree

Judy Vance, Joseph C. And Elizabeth A. Anderlik Professor of Engineering, has received an Honorary Degree of Doctor of Engineering from Heriot-Watt University in Edinburgh, U.K.

Heriot-Watt University has awarded Honorary Degrees every year since 1966, and has recognized more than 400 exceptional individuals for their outstanding achievement and distinction in spheres of activity that align with the mission and ambition of the university.

Vance was honored for her preeminence in, and outstanding innovative contribution to, advancing virtual reality engineering design applications, as well as for her influence as an advocate to promote the participation of women in engineering.

She first started collaborating with Heriot-Watt University after a Virtual Manufacturing Workshop in 2006 at the IEEE Virtual Reality Conference. Since then, she has participated in visits, given keynote presentations, and helped create relationships between Heriot-Watt University and the wider American virtual reality community.

Vance and her family traveled to Scotland in June 2012, where she was acknowledged in a formal ceremony at the university.

Vance

Second Humboldt Fellowship for Levitas

Levitas

Valery Levitas, Schafer 2050 Challenge Professor and faculty member in both aerospace and mechanical engineering, has received an Alexander von Humboldt Foundation Fellowship for alumni in recognition of his research the field of mechanics of materials.

Levitas received a Humbodlt-Research Fellowship in 1993 that allowed him to conduct research for two years in Germany. After his first Humboldt award, he was considered an alumnus of the program, making him eligible for his most recent recognition.

The alumni award provides funding for up to three months of research in Germany, including support for a postdoctoral student from the US. Levitas is spending part of the term researching at the University Erlangen-Nuremberg, while his post doc, Oleg Zarechnyy, is working there for the entire three months.

He has dedicated time to give talks at several German Universities and will participate in two international conferences over the course of the fellowship. He will also establish collaborations with German professors and students to research mechanics modeling of complex surfaces and interfaces, such as those found in nanotechnologies.

"Advancing modeling of mechanics is especially important for nanoobjects, like nanowires, nanoparticles, and nanofilms, as well as for interfaces between nanotwins in bulk materials," explained Levitas. These sorts of nanoobjects can help researchers create new materials and devices with broad applications.

He adds he'll also be working to attract German PhD and postdoctoral students to apply to Iowa State.

Iowa State researchers double down on heat to break up cellulose, produce fuels and power

Continued from Page 3

"The physics and chemistry will be behind all these models and images," Kong said. "This is a very new area to study. We can use these models as a tool to understand what will happen as this technology is scaled up."

Contributing to the systems and virtual reality models are Guiping Hu, an assistant professor of industrial and manufacturing systems engineering, and Eliot Winer, an associate professor of mechanical engineering and associate director of the Virtual Reality Applications Center.

The ultimate goal of all the modeling and testing is to develop a new biorenewables landscape for Iowa and the country. The Iowa State idea calls for biomass to be transported to small, local fast pyrolysis plants that would convert crop biomass into liquid bio-oil. The bio-oil would be easily transported to bigger, regional facilities where it could be gasified and processed into transportation and boiler fuels.

One place to start building that vision is the high bay facility on the north side of Iowa State's Biorenewables Research Laboratory. One morning this fall, Creager was there putting the bio-oil gasifier back together after completing some gasification trials. He planned to run the gasifier at higher pressures later that week, which is required for efficient fuel synthesis.

Once the machine is fully tested and operating at full speed, Creager said it could continuously gasify nearly 4.5 pounds of bio-oil an hour. That's enough to help researchers understand how the technology could one day contribute to an advanced bioeconomy.

Contributed by News Service

An eye-opening experience

For years, educators and employers have been fervently promoting the importance of gaining experience through internships and co-ops as part of a well-rounded education. Mechanical engineering senior **Robert Hanson** has learned first hand from two internships how valuable experiential learning really is. Although each was a diverse experience, both were equally influential to his future.

Hanson completed his first internship at Intromac, a Spanish engineering firm, during his sophomore year while he was studying abroad in Spain. Although he was at an engineering firm, the position focused more on communication, allowing him to utilize his second major, Spanish.

To gain engineering experience, Hanson has spent his summer working at the well-known packaged-foods company ConAgra Foods. The internship has given him a good look at the engineering industry and provided valuable perspective he would not have gained without the internship.

Living just a few blocks from the organization's Menomonie, Wisconsin, location, a typical day begins with a short walk to the plant. Around 6 a.m., he meets with the night shift manager to discuss one of his projects—the playbook.

The playbook is a manual that describes how to put together the factory's heat exchanger, which is used for killing bacteria and cooling Snack Pack pudding cups. Getting to know every detail of the machine and understanding the engineering behind it, Hanson is documenting the step-by-step construction process.

"We have to make it foolproof," he explains. "The idea is that someone who has never worked with the heat exchanger can pick up this book and know exactly how to take the machine apart and put it back together."

Later in the day, Hanson moves to the cocoa side of the factory, where ConAgra packages Swiss Miss hot cocoa mix. Here he is doing statistical analyses to determine whether or not the company should buy a new feeding machine it is testing. Used for measuring more accurate weights of cocoa powder being put in packets, the machine has the potential of saving the company money by reducing the loss of product.

Hanson says the project has opened his eyes to what it's like to work under a constant deadline, trying to keep up with the enormous amounts of data the plant produces in a day.

"Sometimes, the pressure can get a bit overwhelming. At the same time, it always makes me feel alive and excited, because I am working on something that will make a difference at ConAgra," he adds.

Additionally, Hanson says he has met some fantastic engineers who have supported him throughout the internship, and he has had experiences he will never forget. One of these includes getting to talk with one of the vice presidents of the company, who was touring the plant for updates.

One of Robert Hanson's projects during his internship with ConAgra in Menomonie, Wisconsin is to put together a manual for a machine that kills bacteria and cools Snack Pack pudding cups.

"Each of the employees at the plant's stations had the chance to present their work to the plant managers and VP, but when they got to our station he specifically asked what I was working on," Hanson explains. "I only talked for about 30 to 40 seconds, but I was proud to share my work with people so high up in the company."

As the summer internship comes to an end, Hanson finds himself wishing he had more time at ConAgra. Although he learned something new everyday, he felt it took him a while to get a handle on navigating the plant and getting comfortable with his position.

Hanson will be graduating in May 2014, giving him an extra summer for an internship, but he is thinking about taking on a co-op instead, noting that although it will push back his graduation date, he has nothing to lose and everything to gain.

"No matter what your major, there's nothing better for your education than experience," he says. "I've enjoyed my time at ConAgra. It has been a real eye-opener for me, but I am excited to find opportunities elsewhere and test the waters a bit."

Following graduation, Hanson hopes to pursue an engineering career in a Spanish-speaking country—something that combines his interests, applies his knowledge and skills, and also helps him continue to grow.

Contributed by ECR

Lunabotics club mines success in NASA competition

After leaving NASA's annual Lunabotics Mining Competition empty handed the past two years, ISU team members were determined to stand out at this year's contest. Armed with a new design, Team LunaCY did that and more, earning first place in the categories of on-site mining, outreach, and communications with their robot, ART-E III.

Members of the club traveled to Cape Canaveral, Florida in May 2012, competing against students from 58 other universities to see which teams' robot could mine the most moon soil, or regolith, during a 10-minute time period. ART-E III was able to well surpass the competition's collection requirement of 10 kilograms of regolith, successfully collecting 39 kilograms during the first round and ensuring the team a spot in the final round.

Overall, the team earned an estimated 100 points, a score that factors in all the competition's individual categories. The total was almost enough to surpass the University of Alabama, which earned approximately 109 points and came away with the grand prize, the Joe Kosmo Award. While LunaCY did not receive the top prize, the team won the Communication Efficiency Award as well as the Outreach Project Award–a well-deserved recognition of the club's 200 hours of outreach promoting STEM programs that reached more than 3,000 children.

Front row (L-R): Kyle White, Katie Goebel, Ben Reuter, Mariangela Lindquist, Lauren Wickham-Kolstad, David Pieffer, Ben McNeill, Jim Heise (adviser) Back row: Chris Miller, Ashley Pitkin, Andrew Klein, Nathan Beougher, Ricardo Canahui, Alex Grant, Chris Walck, John Charles, Ryan McCleish, Aren Hill.

Kirpes named 2012 Tau Beta Pi Laureate

Carl Kirpes, senior in mechanical engineering and industrial and manufacturing systems engineering, was selected as one of five 2012 Tau Beta Pi Laureates, an honor bestowed on only 83 students since 1982.

Kirpes

Tau Beta Pi looks among its members each year for outstanding students with talents outside the field of engineering – including the arts, athletics, diverse achievements, and service – to apply for the Laureate Award. Kirpes received the award for diverse achievements.

Kirpes completed his coursework in August 2012, earning degrees in both mechanical engineering and industrial and manufacturing systems engineering, while also graduating in the top two percent of his engineering class.

Entering the College of Engineering in Fall 2008 while enrolled in the University Honors Program, Kirpes immediately took advantage of the many opportunities the university had to offer. As a member of the ISU football team, Kirpes says he enjoyed his time playing under coach Paul Rhodes for two seasons before a surgery prevented him from continuing.

"It was a great experience for me," says Kirpes. "I learned a lot about being all-in and achieving goals both on and off the field."

In addition to athletics, Kirpes participated in many organizations, and was often honored for his hard work and success.

He participated in the Engineering Leadership Program, served as vice-president of Order of the Rose and Chessman, was president of both the Cardinal Key and Alpha Lambda Delta/Phi Eta Sigma honor societies, and was a member of the Motor Board, Golden Key International, and Phi Kappa Phi honor societies. Kirpes has also been recognized as an All-Cyclone Team Captain, as well as with the High Scholar Athlete Award, University Honors Program Outstanding Student Award, and Wallace E. Barron All-University Senior Award, just to name a few.

While earning his degrees, Kirpes was a part of several undergraduate research opportunities. As a freshman, he worked with ME professor and new Senior Vice President and Provost, Jonathan Wickert, assisting with research on the lateral vibration in magnetic tape transport. Kirpes later began working with assistant professor of industrial and manufacturing systems engineering (IMSE), Lizhi Wang, studying the future impact hybrid vehicles will have on the electricity market.

Kirpes spent his junior year working with Joseph and Elizabeth Anderlik Professor of Engineering Judy Vance in the Virtual Reality Applications Center. There, he performed an analysis of a single-wall versus multi-wall immersive environment on shopping experiences for consumers. The study led to a published research paper that was presented by Vance at the ASME 2011 World Conference on Innovative Virtual Reality.

With help from Dave Sly, IMSE senior lecturer and president of a company called Proplanner, he went to work at the company and assisted with implementing industrial engineering systems-based software in manufacturing companies and helped install and teach the software at colleges and universities.

Upon graduation, Kirpes plans to move to Kansas City, Missouri, where he will begin work for GENESYS Systems Integrator.

"I'm fortunate to be able to take the knowledge and experience I gained during my time at Proplanner and apply it at GENESYS Systems Integrator," Kirpes explains.

Kirpes will rotate through the different departments at GENESYS, learning more about the company and eventually moving into an engineering sales position. He will have the opportunity to work in management and explore the potential of building of a new department centered on Proplanner software.

Pursuing a master's degree in systems engineering is also on his agenda. He started taking distance education graduate courses this fall at Iowa State, to help him stay connected with the institution he feels has given much to him over the past four years.

"All the people here in the Iowa State community who have mentored me and helped me along the way have contributed significantly to my success," says Kirpes.

"From the professors I have done research with, to my current boss, to the advisers of the organizations I have been a part of–working with and learning from each one of them has been a stepping-stone toward the next opportunity. Everyone here is striving to help students achieve, and I am very appreciative of that."

Kirpes was recognized for his achievement with a plaque and $2,500 at the 107th annual Tau Beta Pi Association Convention in September in Lexington, Kentucky.

Contributed by ECR

Starns receives outstanding faculty award

Gloria Starns, senior lecturer in mechanical engineering, received an outstanding faculty award from Kappa Alpha Theta, an academic fraternity for women. Starns was nominated for Kappa Alpha Theta Fraternity's Ten Outstanding Faculty Members by members of the Gamma Pi chapter of Kappa Alpha Theta on the ISU campus. 124 applications were received from chapters across the United States and Canada.

Starns says the award is especially meaningful because it is a student initiated award. "I was fortunate to have had the opportunity to advise and teach engineering students from the time I began working on my graduate degrees at Iowa State," she said.

MacDonald receives ASME Young Investigator Award

Erin MacDonald, assistant professor of mechanical engineering and affiliated researcher at the U.S. Department of Energy Ames Laboratory, recently received the ASME Design Automation Young Investigator Award. The award recognizes an outstanding young investigator who is making noteworthy contributions in the area of design automation, including research in design representation, design optimization, design evaluation, and/or design integration.

MacDonald's research integrates concepts from psychology, economics, and marketing into engineering design methods. She aims to increase the sustainability of products and technologies by improving the representation of the consumer in the design process.

"Being selected as Outstanding Young Investigator is such an honor. It demonstrates that quantitatively combining social science with engineering is gaining traction in the engineering design community," MacDonald said. "It was a great feeling to celebrate this award with my lab group, the IRIS Design lab, as we have all worked hard the past three years to establish this new field of research."

MacDonald was honored with a certificate and an honorarium during ASME's 2012 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference in Chicago, Illinois, which took place August 12–15. She is the fourth recipient of the award.

Former ME student returns as assistant professor pursuing clean energies

The Department of Mechanical Engineering is welcoming a familiar face back to campus. Former student **Mark Mba Wright** is re-joining the department, but this time as a faculty member.

Wright graduated from Iowa State in 2005 with a bachelor's degree in mechanical engineering as well as one of the first master's degrees awarded in biorenewable resources and technology.

He then spent a summer researching at the National Renewable Energy Laboratory in Golden, Colorado, before returning to Iowa State to earn a PhD in mechanical engineering and in chemical engineering.

Throughout this time, he researched biomass and how to convert it into a fuel that is compatible with vehicles on the road today, working closely with Robert Brown, Anson Marston Distinguished Professor of Engineering, Gary and Donna Hoover Chair in Mechanical Engineering, Iowa Farm Bureau director of the Bioeconomy Institute, director of the Center for Sustainable Environmental Technologies, and professor of mechanical engineering, chemical and biological engineering, and agricultural and biosystems engineering.

Wright also worked with W. Ross Morrow, assistant professor in mechanical engineering, researching the economic impacts these technologies would have on society.

In 2011, Wright took a position as a postdoctoral student in chemical engineering at the Massachusetts Institute of Technology (MIT), where his research again involved biomass. His focus turned toward opportunities for improving fossil fuels with biomass energy in a sustainable and environmentally conscious manner.

Working with William Green and Yuriy Roman, Wright investigated integrating biorefineries with conventional refinery technologies. He also studied converting biocompounds into fuels and chemicals, and was able to incorporate what he knew about economics and biomass to further strengthen his research.

Assistant Professor Mark Wright has returned to the ISU Mechanical Engineering Department to pursue his interests in biomass and the future of energy research.

After a year and a half at MIT, he pursued a position at Iowa State and was more than eager to join the faculty this fall as a tenure-track assistant professor.

"I'm really passionate about biomass and our energy future," says Wright. "There was no doubt in my mind that Iowa State was going to be a great place for me to work with leaders in this field as well as to contribute my own expertise toward how we can develop alternative energy sources."

During his first semester, Wright will be teaching an introductory course as well as developing biosystems analysis courses for the college that will be available in the near future.

He will also be continuing his research by expanding upon the foundation he set while completing his PhD and imagining technologies for a fossil-free energy future.

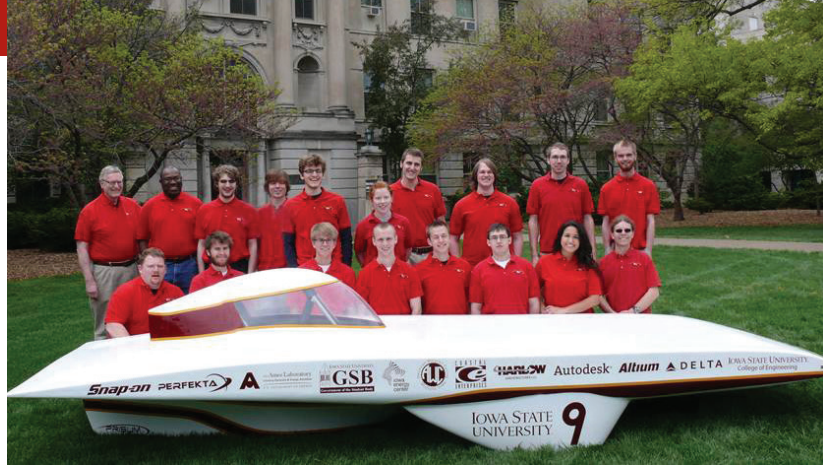
Moving to Ames with his wife and newborn son, Wright looks forward to raising a family in the community. "Having our family grow in Ames is very appealing," says Wright. "The community has a lot to offer, and we look forward to being a part of it."

Contributed by ECR

Team PrISUm races Hyperion to second place finish at 2012 FSGP and ASC

Team PrISUm arrived at the Monticello Motor Club in Monticello, NY on July 6. After four days of registration and scrutineering, Team PrISUm was ready for the 2012 Formula Sun Grand Prix. The race also acted as a qualifier for the American Solar Challenge. To qualify, teams were required to complete 105 laps in a single day or 160 laps in two consecutive days. The lap length was 1.6 miles.

Team PrISUm and Hyperion completed 125 laps on the first day, July 10, easily qualifying them for the American Solar Challenge. It was clear to Team PrISUm that they were performing exceptionally, and their biggest competition would be the University of Michigan. Over the next two days, Team PrISUm completed 146 and 155 laps, making their total lap count 426. Hyperion raced a total of 681.6 miles, with an average speed of 28.4 MPH. This placed them in second behind the University of Michigan, who finished with 449 laps. Iowa State earned the fastest lap with a time of 2:18.



The American Solar Challenge, an eight day, 1,652.8 mile race from Rochester, NY to St. Paul, MN, was next. Team PrISUm was one of four teams that completed the race purely on solar polar, without having to trailer. The team came in second place overall, behind the University of Michigan. Hyperion won the best electrical and mechanical system design awards from ASC tech inspectors, and the team had its best racing season in its 23-year history.

ChemE post-doctorate takes on ME assistant professor position

For **Alberto Passalacqua**, transitioning from his position as a postdoctoral assistant in the Department of Chemical Engineering to assistant professor in the Department of Mechanical Engineering is definitely an adjustment. But he feels his research emphasis in computational fluid dynamics of multiphase flows will help make for a smooth move.

Passalacqua began his education in the field of chemical engineering at Politecnico di Torino in Italy, where he was introduced to computational fluid dynamics and performed computer simulations of gas-particle flows in circulating fluidized bed reactors with a research group at the university.

After five years in the joint undergraduate and master's program, it seemed logical for him to begin his doctorate with the same group. His research quickly became more advanced, consisting of two major parts.

The first involved incorporating a more complete description of what happens in a dense gas-particle flow, where particles come in contact with one another and create friction.

The second aspect of his work consisted of adopting the Large Eddy Simulation (LES) approach, a technique used to describe the turbulence of fluid phases in a model for flows with a lower particle load. LES aims at directly resolving the large-scale fluctuations of the fluid phase, modeling only the smallest fluctuations and reducing the computational cost of the simulations without sacrificing their accuracy.

In 2008, after being selected as a postdoctoral assistant funded by the U.S. Department of Energy, Passalacqua began at Iowa State, working with distinguished professor of chemical and biological engineering Rodney Fox. In this position, he focused on developing the next generation of models for gas-particle flows, creating a computational code that incorporates these models.

"The position at Iowa State was a natural step for my research," says Passalacqua. "I was able to work on cutting-edge developments while continuing the research I enjoyed doing."

More recently, Passalacqua contributed to a project funded by the U.S. Department of Energy involving uncertainty quantification, which included studying how errors in the input of a model transmit to the outputs. The new methods Passalacqua developed along with the results of this research are important to ensure computational models are reliable.

"I did a longer postdoc in the Department of Chemical and Biological Engineering because I was very interested in the project I was working on," explains Passalacqua.

"This past year, I heard about the opportunity to become an assistant professor in mechanical engineering here at ISU, so I decided to apply and fortunately was selected."

Passalacqua is teaching the numerical and analytical methods course in chemical and biological engineering this fall and will begin teaching in his home department, mechanical engineering, next spring.

He will also continue to mentor two graduate students and is looking forward to hiring PhD students to work on developing multiphase flow models.

Excited to continue the research that interests him most and remain among the faculty of the College of Engineering, Passalacqua also recognizes the position comes with great possibilities.

"I am looking forward to the challenges a tenure-track position offers in creating my own research group, as well as inspiring students and teaching them to do research in computational fluid dynamics," he says.

"There are many new things to learn and new ways to use my expertise. I'm really looking forward to every single step."

Contributed by ECR

Faculty on the move

Promotions

- **Michael Olsen** was promoted to Full Professor (Already Tenured).
- **Xinwei Wang** was promoted to Full Professor (Already Tenured).
- **Terry Meyer** was promoted to Associate Professor with Tenure.

New appointments

- **James Oliver** was named University Professor. Oliver is the Larry and Pam Pithan Professor of Mechanical Engineering as well as the director of the Virtual Reality Applications Center.
- ME department chair **Caroline Hayes** is the Lynn Gleason Professor of Interdisciplinary Engineering.
- **Song Zhang** was appointed the new William and Virginia Binger Assistant Professor of Mechanical Engineering.
- New ME assistant professor **Sourabh Bhattacharya** was named the Henry Black Faculty Fellow in Mechanical Engineering.
- **Jonathan Wickert**, dean of the College of Engineering at Iowa State University, has become Iowa State's next senior vice president and provost. Wickert assumed his new post July 30, and materials science and engineering Professor Mufit Akinc was appointed interim dean to lead the College of Engineering while a search is conducted for a new dean.

  Wickert has served as dean of the College of Engineering since 2009. He is the James and Katherine Melsa Professor of Engineering and a professor of mechanical engineering. He came to Iowa State in 2007 as chair of the department of mechanical engineering and the Larry and Pam Pithan Professor of Mechanical Engineering.

- **Ted Heindel** has been appointed leader of the energy utilization portion of a project aimed at building Iowa's research capacity in renewable energy and energy efficiency. Heindel, Bergles Professor of Thermal Science, will become one of four co-leaders of Iowa's $20 million National Science Foundation's (NSF) Experimental Program to Stimulate Competitive Research (EPSCoR).

  "Ted is a great addition to our team and is well suited to lead the energy utilization platform with his expertise in both energy research and education." said Robert C. Brown, leader of the Iowa NSF EPSCoR program. Brown is Anson Marston Distinguished Professor in Engineering, the Gary and Donna Hoover Chair in Mechanical Engineering, and the Iowa Farm Bureau Director of Iowa State's Bioeconomy Institute. He noted that Heindel specializes in thermal-fluid sciences, which form the backbone of many energy production and utilization systems.

  Heindel said, "The goal for our platform is to increase the research activities in the areas of energy utilization and energy efficiency at all three Regent institutions. The faculty members working in this area are doing great. I would like to help them succeed and bring additional collaborators to the table." Heindel is also leading an effort, through another project, to add a minor in energy systems as well as a coursework-only masters of engineering degree in energy systems at Iowa State. He holds a bachelor's degree from the University of Wisconsin-Madison and master's and doctoral degrees from Purdue University.

Bhattacharya seeks clean, low-cost energy solutions

Bhattacharya

Sourabh Bhattacharya, new assistant professor in mechanical engineering, says his interest in math and science was inspired by his father, who is an electrical engineer. Bhattacharya, however, opted for a career in academia for the atmosphere of creative and imaginative problem solving.

A native of Bombay, India, Bhattacharya attended the Indian Institute of Technology in Bombay to receive his undergraduate degree in mechanical engineering in 2002. By 2010, he had received a master of science in both applied mathematics and electrical engineering, and a PhD in electrical engineering from the University of Illinois at Urbana-Champaign.

During graduate school, he served as a research assistant at the Beckman Institute from 2002-2007, where he studied vision-based control and motion planning for autonomous vehicles. He later became a research assistant in the Coordinated Science Lab from 2008-2010, working on problems at the interface of game theory, communications, and motion planning for multi-agent systems.

Bhattacharya stayed at the Coordinated Science Lab as a post doctoral research associate, exploring optimal sensing strategies in the face of data deluge and security in cyber-physical systems.

Each time he works on something new, he says his appreciation for how engineering research works to solve problems relevant to society grows.

The impact of engineering was something he realized first-hand during his undergraduate program in India, when he worked on one of his most interesting projects. He and other students were asked to build an electric wheel chair that would run on solar energy.

"I remember that the most challenging part was to come up with ideas for storing enough power during the day so the chair could work at night," Bhattacharya recalls.

In the future, Bhattacharya says he would like to apply engineering research to situations like the one demonstrated in the wheelchair project: cost effective and environmentally responsible.

"I'd like to investigate, understand, and solve problems related to clean and cheap power generation and distribution in economically challenged nations," he says.

As he gets settled into his new position at Iowa State, though, he says his primary research will stay focused on where he has the most experience: optimal control and differential games with applications in robotics, mobile sensor networks, and unmanned vehicles.

"I am specifically interested in expanding my understanding of competitive interactions between rational agents, or agents that make their own decisions based on the available information, and their implications in motion planning strategies for autonomous vehicular networks," Bhattacharya says.

He will also be teaching courses in control theory and engineering at both the undergraduate and graduate level.

Contributed by ECR

Kim honored with DARPA Award

Gap-Yong Kim, assistant professor in mechanical engineering, recently received the Defense Advanced Research Projects Agency (DARPA) Young Faculty Award.

The award, established to recognize junior faculty members who show great potential and expose them to the needs of the Department of Defense, will provide $231,912 to fund a two-year project.

The overall goal of Kim's project will be to advance material processing methods to create composite materials of complex microstructural designs, and eventually be able to control and alter their properties. The project will help engineers better understand strengthening in composites that involves multiscale architectures.

"I want to establish a manufacturing platform that can create multi-level reinforcing structures in a high-strength, lightweight magnesium alloy composite panel," said Kim, who is also an associate in the U.S. Department of Energy's Ames Laboratory. "The panels have a great potential for building armors, protective structures, and lightweight, fuel-efficient vehicles."

Kim's proposed manufacturing platform will combine several processing steps– ultrasonic spraying will be used to create nano/micro-scale patterns on magnesium sheets, which will then be densified by pressure-assisted, mushy-state sintering.

After manufacturing the composite, the team will perform mechanical testing and compositional analysis to understand the relationship between the composite structure and mechanical properties.

"We will study atomization, transport, and deposition of spray droplets that contain microelements as well as how the deposited structures change into reinforcing architectures within the composite material," he said.

Kim and his team began the project last summer and hope the project will deliver a cost-effective technology that can make high quality composite panels for defense applications.

Gap-Yong Kim receives his DARPA Young Faculty Award.

Schwartz offers wide range of research interests

Schwartz

With research aimed at understanding the interfaces between humans and materials, **Cris Schwartz** adds a focus on engineering design to the mechanical engineering department.

While completing his bachelor's and master's degrees in mechanical engineering at Iowa State in 1996 and 1998, respectively, Schwartz got his feet wet in tribology, a field that investigates the friction and wear of high-temperature polymers.

From there, he began working for the Southwest Research Institute in San Antonio, Texas, serving as a mechanical designer and project manager. The pull of academia was too great, however, so after five years in Texas, Schwartz entered into the PhD program at Iowa State.

"I had a passion for engineering design and had learned many lessons during my time in industry that I wanted to share with engineering students," says Schwartz. "I also wanted to start performing research without profit motives and in areas that were of most interest to me."

He continued his tribology research but with biomedical applications, studying the bearings in artificial hips and joints, exploring ways to improve the wear of the plastic surfaces used in them.

He expanded his research to include tactility and human sensory assessment of surfaces at Texas A&M as an assistant professor. He has examined how people can use surfaces for communications through braille, including how to further improve that form of communication to better illustrate concepts in math, science, and engineering.

"I would like to enable people with visual impairments to be able to participate more fully in the STEM fields, and provide them with a way to get better quantitative and graphical information from their text books," Schwartz explains. "There are many brilliant visually impaired students who aren't in the engineering field, and I would like to make it more accommodating for them."

He plans to use this research and other projects to collaborate with his peers at Iowa State. In terms of his studies on tactility, Schwartz feels there may be some overlap with the research currently being done in the Virtual Reality Applications Center, and he would like to look into putting the sense of touch into that environment.

He also hopes to work with other faculty members and scientists at the U.S. Department of Energy's Ames Laboratory to explore ways to convert heat produced during friction into a useful energy source.

In addition, Schwartz will satisfy his passion for teaching by leading an undergraduate machine design course in the spring.

"Iowa State is a high-quality and nationally recognized institution," he says. "I've noticed that it has really retained a lot of the character it had from my time in school, and I think it now has even more of a personal touch so many students feel they are valued and important."

Contributed by ECR

ME graduate student makes discovery in ductwork

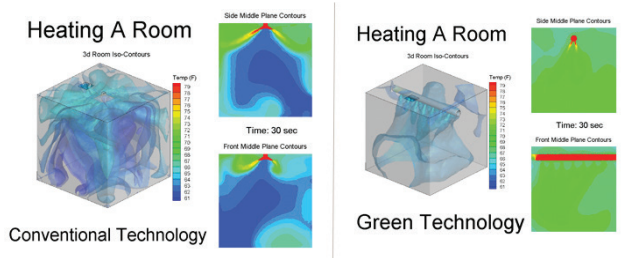
When it comes to creating more energy efficient ventilation systems, one Iowa State student's research is paving the way for major advancements in the industry.

Anthony Fontanini, graduate student in mechanical engineering (ME), is working on several projects that show how simply changing is materials can conserve energy by nearly 25 percent in heating, ventilation, and air conditioning (HVAC) systems. He says replacing standard sheet-metal ducts with fabric ducts could be another great way to promote "green" building, and help reduce the carbon footprint of building even further.

Fontanini began his education at the University of Wisconsin Platteville, where he ran track and received his bachelor's degree in mechanical engineering. After graduation, he decided to explore his interest in thermo fluid heat transfer at Iowa State.

While the computational experimental complex fluids program was a big draw for Fontanini, it helped that attending Iowa State was fully supported by his father, a CoE alumnus who graduated in 1972.

Fontanini met ME associate professor **Michael Olsen** shortly after arriving on campus. Olsen was looking for a student with hands-on experience in HVAC and an interest in computational science. An ideal candidate, Fontanini was able to get started with a research project right away.



The photo on the left represents the dispersal of heat in a room over a period of thirty seconds using conventional ductwork. The photo on the right illustrates the more even and timely dispersal of heat using fabric ductwork in a room of the same size and over the same period of time.

Working closely with co-advisers Olsen and ME assistant professor **Baskar Ganapathysubramanian**, he created models and ran experiments that analyzed the thermal comparison between standard ceiling diffusers and fabric ductwork diffusers.

"We found that with fabric ducts, the temperature contours are much more uniform across a room," he explains. "Fabric ducts contain less parts, are lighter in weight, easier to transport than standard ducts, and allow a room to heat up faster."

According to Fontanini, these results have always been assumed among the science and engineering communities; however, it is difficult for new products such as fabric ducts to break into the market.

"With this research we aren't necessarily trying to prove that fabric ducting is the best. We are trying to change the way engineers and scientists view energy analysis," he says. "It's difficult to get research funding for younger technologies. We're attempting to develop tools that the entire industry can use for research, design, and analysis, which could open up opportunities to explore other new technologies."

While Fontanini's original experiment looked at energy efficiency at the residential level, he is now working to apply his findings to large retail stores or indoor training facilities, where HVAC systems are always running.

In addition to his graduate research, Fontanini recently returned from a six-month internship at the Fraunhoufer Center for Sustainable Energy. Originally recruited to work on a project with a ductwork system using aerogel-based material (a very low conductive material that insulates well), he was able to contribute much more to the center by developing a thermo lab, automating different processes, and working with software.

"The internship gave me a great general perspective," Fontanini explains. "I now better understand how industry and the Department of Energy intermix, how new products are developed, where funding comes from, and how projects are started."

On track to graduate in 2014, Fontanini will continue his research at Iowa State, but that doesn't stop him from thinking about the future. "My goal is to work for a national lab. My top choices would be the National Renewable Energy Laboratory or Oak Ridge National Lab," he says, adding that he hopes his experiences so far will allow him to pursue those options.

"I have developed many different skills and provided work that the entire industry could find useful," says Fontanini. "But the most rewarding part in all this research has been the potential to change the way people think and challenge the way things are done."

Contributed by ECR

ME alumni honors

Joshi receives Anson Marston Medal


Joshi

Dr. Sadanand D. Joshi (PhDME'78) received the 2012 College of Engineering Anson Marston Medal in recognition of his outstanding achievement in advancing engineering science, technology, or policy having national and international impact in academics, industry, public service, government, or other venues.

Joshi, president and founder of Joshi Technologies International, Inc. (JTI), is widely known for his contributions to developing horizontal well technology to produce crude oil and natural gas.

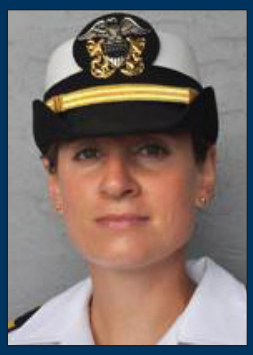
Author of the best-selling book Horizontal Well Technology, which was published in 1991, Joshi also co-authored Geological Aspects of Horizontal Drilling with R. D. Fritz and M. K. Horn, published that same year. He has had nearly 50 technical papers published with the Society of Petroleum Engineers (SPE), American Society of Mechanical Engineers (ASME), Petroleum Society of Canadian Institute of Mining, and other industry organizations.

Joshi has delivered more than 200 lectures in 30 countries and served as a distinguished lecturer for SPE from 1995-1996. In 2000, Hart Publications named him "One of the 100 Most Influential People of the Petroleum Century."

He is a member of SPE, the American Association of Petroleum Geologists, ASME, the Tulsa Chamber of Commerce, and the U.S. Chamber of Commerce/U.S. India Business Council.

Joshi received his B.E. in mechanical engineering from the Walchand College of Engineering in 1972 and his M.Tech. in mechanical engineering in 1974 from the Indian Institute of Technology.

Guccione receives Outstanding Young Alumni Award


Guccione

Leia Guccione (BSME'04) received the Outstanding Young Alumni Award by the ISU Alumni Association for excelling in her profession and providing service to her community.

As a naval nuclear engineer on the U.S.S. RONALD REAGAN, Lieutenant Guccione led a diverse 40-person organization of technicians and supervisors responsible for the ship's main machinery room and associated main propulsion turbines, electrical generating turbines, pure water distilling units, air compressors, and associated pumps and support equipment. She directly supervised operations and maintenance in the nuclear propulsion plant. Under her leadership, her machinery room earned top scores in external assessments and Guccione earned a reputation for her consistently positive attitude and her outstanding leadership abilities. She was named the 2008 Propulsion Plant Watch Officer of the Year.

Guccione has always been passionate not only about her own career and activities, but about giving back and inspiring others – both in the U.S. Navy and outside of her professional career. She is currently the national outreach chair-elect for the Society of Women Engineers and the outreach chair for the Society of Women Engineers San Diego. She is also the program director for STEP Up: The Service Through Engineering Program.

A two-time recipient of the United States Navy Achievement Medal and a 2010 recipient of the U.S. Navy Commendation Medal, Guccione is a former recipient of the ISU Alumni Association's Wallace E. Barron All-University Senior Award, the ISU Department of Political Science's Ross Talbot Outstanding Senior Award, the ISU College of Engineering's Dean's Leadership Award, and the ISU President's Leadership Initiative Junior Leadership Award, among others.

NSF GRFP honors Dedic with fellowship

ME alum **Chloe Dedic** (BSME'12) is joining a prestigious group of past National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) recipients. Dedic will join a list that includes Nobel laureate and U.S. Secretary of Energy Steven Chu, Google founder Sergey Brin, and Freakonomics author Steven Levitt.

She will receive a three-year annual stipend of $30,000 and a $10,500 cost of education allowance for tuition and fees as NSF GRFP Fellows. She will also be given opportunities for international research and professional development, and the freedom to conduct her own research at any accredited U.S. graduate program she chooses.

The GRFP promotes science and engineering in the United States by recognizing and supporting outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based master's and doctoral degrees. The program has a long history of selecting recipients who go on to achieve high levels of success in their future academic and professional careers.


Dedic

Dedic, who has been concurrently working on her undergraduate and master's degree in mechanical engineering at Iowa State, works in ME associate professor Terry Meyer's research laboratory. She is using laser diagnostics to study combustion processes in order to develop clean energy technologies, and hopes to use her fellowship to continue her work.

"I was extremely excited when I discovered I had received the award, and the first thing I did was call my parents to tell them the news," Dedic said. "Then, I went back to work! To me, receiving an NSF fellowship is a call to action. A committee of top scientists and engineers believe I have the potential to contribute to important research, and I want to work to prove them right."

ME students' coursework put to the test by Ugandan women farmers

Each semester students from the sophomore engineering design course ME 270 use their engineering skills, coupled with creativity, to produce technologies for the betterment of developing nations. This summer, one project made it beyond the design stage and was put to use in Eastern Africa, where it has potential to make a big difference for farmers.

Last spring, Brent Smith and a team of four other ME students designed a seed cleaner, or fanning mill, that would provide clean grain, in less time, and with better working conditions for soybean farmers in lesser developed countries.

The project stemmed from a grant awarded to the Value Added Agriculture Program (VAAP), which operates through Iowa State Extension and the College of Agriculture and Life Sciences to help farmers establish or expand farmer-initiated, value-added agriculture businesses.

Smith then spent the summer enhancing and tweaking the team's original design, and eventually the fanning mill made its way to Uganda to be tested, something he says is exciting for him, but more importantly for the people it will help.

VAAP searches for solutions for Ugandan farmers

A partnership between ME 270 and VAAP wasn't necessarily planned, but it became increasingly important as the program worked through a significant project.

In 2011, VAAP was awarded a grant from the U.S. Agency for International Development (USAID) through the Farmer-to-Farmer program. From there, VAAP representatives began working with a niche group of farmers in the Kamuli district of Uganda.

The program's co-directors, Margaret Smith and Linda Naeve, traveled to the district to assess the needs of women farmers and also formed a team of female farmers from Iowa willing to volunteer their time and skills. With her past experience as a volunteer in the Peace Corps, Margaret Smith was well prepared for the work that would need to be done in this underdeveloped area.

The team utilized weak link analysis to determine where aid for these farmers would be most effective. One of the biggest concerns to address was that the farmers lacked marketing skills, effective post-harvest handling techniques, and the ability to see the crops for their value.

VAAP assisted the women by creating small business associations among the farms, bringing farmers together to share the cost of transporting grain to better marketplaces and share purchases of farm equipment that would be too expensive for one farmer to purchase alone.

After the Ugandan farmers improved their grain quality with bicycle-powered maize shellers, VAAP increased focus the next year to the farmers' soybean enterprise. Soybeans proved to grow well and offered another income and food source for farm families in the district. While the crop was doing much good for these farmers, the women expressed struggles with soybean harvesting.

An arduous process, harvesting soybeans requires the women to pull the crop by hand or cut it at the surface of the ground and allow the plants time to dry in the sun, with pods attached. Farmers then separate the soybeans from the pods by tapping them with a stick. Next, they put those beans into a large, shallow basket and winnow them. Traditional winnowing involves throwing a grain mass into the air and allowing the wind to remove the chaff.

Because of a lack of natural air movement in the area, this method does not work well for farmers in the Kamuli district as it requires them to blow on a grain mass while tossing it into the air. This process leads to inhalation of debris, resulting in respiratory problems and allergic reactions in farmers' eyes and skin.

In need of a solution, VAAP reached out to ME 270.

ME 270 revives an old technology to assist the VAAP initiative

As ME 270 is already programmed to manage projects like VAAP's, it seemed logical for students in the course to create a seed cleaner that would help the Ugandan farmers.

"The best thing we can teach our students is what an engineer can truly do for society by serving people," says Jim Heise, a lecturer who teaches ME 270."Projects like these offer a way for engineers to fight poverty by providing economic opportunity where it already exists."

Brent Smith and classmates Anne Alter, Nathan Beougher, Jeffery Grenier, and Xingyuan Ma, who are all now entering their third year in ME, christened themselves "Team Clean Machine," and were eager to design a fanning mill that operated more efficiently and cleanly than the winnowing method.

Two ME alums named 2012 STATEment Makers

Chris Deal (BSME'08) and Wes Meier (BSME'08) have been named 2012 STATEment Makers by the Iowa State University Alumni Association. The honor recognizes the early personal and professional accomplishments and contributions to society of Iowa State University's young alumni (graduates under 32 years of age).

When **Wes Meier** took an ISU senior design course called Appropriate Technology, he worked with a team to design, test, and install a water valve for a rural village in Mali, Africa. It was a class and a project that changed his life forever. After graduating Wes signed up to be a Peace Corps volunteer in Nicaragua. While there, he and three others started up the not-for-profit organization Emerging Opportunities for Sustainability (EOS) to promote low-cost appropriate technology that generates income, improves health, and reduces environmental impact. Today, the organization consists of five full-time Nicaraguan engineers and more than 30 American volunteers and is making a difference in Nicaragua and beyond.

A Ugandan farmer tests the fanning mill designed by students in ME 270.

Their machine has an operator feeding seeds, along with pod, stem, and leaf residue, into the mouth of a hopper located on the top of the device. The seeds then funnel downward while the operator turns a crankshaft. As it turns, the crankshaft runs through the bottom of the hopper, agitating the contents, which fall through a controlled opening via a slider.

A fan, also powered by the crankshaft, blows air onto the falling contents, removing debris from the slider while the heavier beans fall directly into a basket. This version of a fanning mill is similar to many used in agriculture, but simpler and produced at a much lower cost.

After seeing the mill in action, Margaret Smith was so impressed she offered a $350 grant to perfect the design to be implemented in Uganda. Brent Smith accepted the challenge and registered for an independent study course.

"I was already planning on staying in Ames to take summer courses, so it just made sense to continue with this project," he says. "There was also a great need for this machine in Uganda so I was happy to work on it."

In August, three women farmers from Iowa—Lori Lang of Vinton, Cindy McCullough of Webster City, and April Hemmes of Hampton—met with him to learn more about the mill before setting out for Uganda to put it to the test.

During their time in Uganda, the volunteers visited 10 farms, showing the farmers how the machine worked and gaging interest.

The fanning mill was an instant hit.

Previously, farmers could only clean 100kg, or about four bushels of soybeans, in two days, spending around 16 hours on the process, which comes out to about ¼ bushel per hour. With the fanning mill, the women could process 6.6 bushels each hour.

After seeing how useful the mill could be, the volunteers took it to St. Joseph's Vocational Center, a local technical school, to show students and staff how it functioned and was constructed. Those at the school will work to re-create the machine using local tools and supplies so it can be made available at a reasonable cost to farmers. Staff and students in Uganda will also be in contact with ME 270 students this year, continuing to provide feedback on potential design improvements.

ME 270 and VAAP look forward to continuing a humanitarian partnership

Projects like this happen each year in ME 270, as Heise continually emphasizes working with organizations like VAAP—groups that are passionate about supporting developing nations as well as advancing the minds of young engineers.

Margaret Smith says a long-standing partnership is something she would fully embrace, and she encourages others to consider the opportunity. "I can't tell you how much I love the ME 270 course," she says. "It's great because it gets young people to start thinking in terms of what they can do with their skill set and training. They may not be designing and creating the most current machine models, but instead are creating new twists on an older design, re-envisioned at a low cost for people who have no access to anything at all—it's brilliant. This class is brilliant."

Contributed by ECR

Chris Deal's spirit of service and entrepreneurship has guided him through not only his college days at Iowa State, but beyond. Inspired by the opportunity he had to touch lives as a student involved in the Dance Marathon organization, he co-founded the nonprofit organization Emerging Opportunities for Sustainability (EOS), traveled to Uganda for a year of scholarship and service as a Rotary Ambassadorial Scholar, and then spent two years working with the Teach for America program as a high school ESL math and science teacher. Today he works as an engineering consultant but continues to actively contribute to community organizations. He serves on the boards for EOS International and Phi Delta Theta Fraternity and makes frequent trips home to help at his family's apple orchard in Jefferson, Iowa.

Department of Mechanical Engineering
2025 Black Engineering
Iowa State University
Ames, IA 50011-2161

Your support makes a difference

Generous gifts from our alumni, corporate sponsors, and other partners enable the mechanical engineering department to continue its tradition of academic excellence. Your contributions to the Black-Hilstrom Excellence Fund make a lasting impact on our program and the success of our students through initiatives that include

- Providing scholarships and fellowships for recruiting and retaining students
- Supporting student leadership groups
- Awarding seed money for new projects
- Funding access to state-of-the-art technology through new equipment purchases and laboratory renovations
- Attracting top-caliber faculty to Iowa State

Please use this form to contribute or contact our development officer, Shane Jacobson, at 515 294-4489 or shanej@iastate.edu to learn about other ways you can support the mechanical engineering department.

Black-Hilstrom Excellence Fund

☐ I would like to contribute to the department in the amount of
☐ $50 ☐ $100 ☐ $250
☐ $500 ☐ $1,000 ☐ Other $_____
☐ I am interested in information on establishing a scholarship, naming a laboratory, or creating a named faculty position.
☐ I would like information on planned giving.
☐ I have included the Department of Mechanical Engineering in my estate plan.

Name _____ Date _____

Degree(s) _____ Year(s) granted _____

Address _____

City _____ State _____ Zip _____

E-mail _____ Phone _____

My gift ☐ does ☐ does not qualify for a company matching gift.

Payment Type

☐ Check enclosed (payable to the ISU Foundation)
☐ Credit card Select type: ☐ Visa ☐ MasterCard ☐ Discover

Credit card number _____ Expiration date _____

Name as shown on credit card _____

Cardholder signature _____

Please return form and payment to: **The ISU Foundation**
2505 University Boulevard
Ames, Iowa 50010-7164

We appreciate your support!